SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-40

Name: Lake Henry **County**: Bon Homme
Legal Description: T96-R58-Sec.9-10
Location from nearest town: 1 mile south, 1 mile east of Scotland, SD

Dates of present survey: August 20-22, 2007 (netting) June 5, 2007 (electrofishing)
Date last surveyed: August 22-24, 2005

Primary Game Species	Other Species
Largemouth Bass	White Sucker
Yellow Perch	Common Carp
Channel catfish	Black Bullhead
Black Crappie	Green sunfish
Bluegill	Hybrid sunfish

PHYSICAL DATA

Surface Area: 165 acres (est.) **Watershed**: 34,699 acres
Maximum depth: 35 feet (est.) **Mean depth**: 18 feet (est.)
Volume: No data **Shoreline length**: No data
Contour map available: No **Date mapped**: NA
OHWM elevation: No data **Date set**: NA
Outlet elevation: No data **Date set**: NA
Lake elevation observed during the survey: Full
Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Introduction

Lake Henry was created by the construction of a dam across Dawson Creek in 1937. It was named in honor of State Senator Henry Brown of Bon Homme County. The lake quickly became a popular water-based recreation spot for the area. By the late 1980s, however, decades of erosion from the watershed had degraded the lake and use had declined considerably.

Plans to renovate the lake began in 1991 after extensive damage to the spillway was discovered. In 1994, the dam was breached and the lake drained to allow spillway repairs and the removal of accumulated sediments. The renovation project quickly ground to a halt when funding was withdrawn and the lake remained dry for nearly a decade.

In 2002, funding for the project was restored. It was determined more economical to build a new dam rather than rebuild the old one. A new site was chosen ⅜ of a mile downstream and construction began late in 2002. The dam was completed in 2003 and completely filled with water in 2005.

Ownership of Lake and Adjacent Shoreline Property

Lake Henry and all surrounding shoreline is owned and managed by the South Dakota Department of Game, Fish and Parks.

Fishing Access

Lake Henry has a two lane boat ramp with a dock located on the southeast corner of the lake near the dam face. There are toilets located near the boat ramp and on the north access area. A handicapped accessible fishing dock is located on the southwest side of the lake. Numerous shore access sites were developed on both sides of the lake and habitat structures were placed to benefit shore anglers. All of Lake Henry has been designated a no-wake zone. At no time may any boat create a visible wake or exceed five miles per hour. This was done to protect the shorelines from erosion and to maintain a quiet and peaceful environment.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Henry was very clear during the survey with a Secchi depth measurement of 0.76m (2.5 ft). Large beds of sago pondweed (*Potamageton pectinatus*), clasping leaf pondweed (*Potamageton richardsonii*), and cattails (*Typha spp.*) were present around the entire lake. Flooded trees were also present especially in the southeast part of the lake.

BIOLOGICAL DATA

Methods:

Lake Henry was sampled on August 20-22, 2007with ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. Trap net sites are displayed in Figure 2.

Results and Discussion:

Trap Net Catch

Bluegill (42.5%), black crappie (41.7%), and black bullhead (9.6%) were the most abundant species sampled in the trap nets (Table 1). Other species caught included white sucker, green sunfish, yellow perch, hybrid sunfish, common carp, largemouth bass, and channel catfish.

Table 1. Total catch from four overnight trap net sets at Lake Henry, Bon Homme County, August 20-22, 2007.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	288	42.5	28.8	±6.4	4.0	80	0	97
Black Crappie	282	41.7	28.2	±8.1	1.1	27	4	100
Black Bullhead	65	9.6	6.5	±3.3	141.8	97	22	90
White Sucker	27	4.0	2.7	±1.1	6.5	100	100	91
Green Sunfish	4	0.6	0.4	±0.3	1.6	--	--	--
Yellow Perch	3	0.4	0.3	±0.2	12.2	--	--	--
Hybrid Sunfish	3	0.4	0.3	±0.3	0.3	--	--	--
Common Carp	2	0.3	0.2	±0.2	1.0	--	--	--
Largemouth Bass	2	0.3	0.2	±0.3	0.6	--	--	--
Channel Catfish	1	0.1	0.1	±0.1	0.8	--	--	--

* Two years (2004, 2005)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20 and an RSD-P range of 20-40.

Lake Henry contains a high-density largemouth bass population created by the stocking of juveniles and adults in 2003 and 2004 (Table 2). Bass recruitment has been relatively consistent (Table 3) and at least 66% of the fish sampled in 2007 were naturally produced. The stocked juveniles and adults were obtained from stunted populations and their slow growth is highlighted in the shaded area of Table 3. Growth of naturally-produced fish has been somewhat faster, but is still slower than regional means. Slower growth and below-average relative weight may be due to the high density of fish.

Table 2. Largemouth bass electrofishing CPUE, PSD, RSD-P and mean Wr for Lake Henry, Bon Homme County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE							77.4		118.5
PSD							35		51
RSD-P							6		8
Mean Wr							106		92

[1] See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Table 3. Average back-calculated lengths (mm) for each age class of largemouth bass in Lake Henry, Bon Homme County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	77	131							
2005	2	30	94	206						
2004	3	46	105	187	236					
2003	4	11	90	178	257	305				
2002	5	40	91	174	233	290	331			
2001	6	13	85	160	223	278	317	351		
2000	7	8	95	162	212	262	307	338	363	
1999	8	5	80	145	250	324	355	403	441	461
1998	9	1	83	172	274	326	373	389	425	439
All Classes		**231**	**95**	**173**	**241**	**298**	**336**	**370**	**410**	**450**
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
LLI* Mean			89	178	256	316	359			

*Large Lakes and Impoundments (>150 acres)

Bluegill

Management objective: Maintain a bluegill fishery with a trap-net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill abundance (CPUE) exceeded the management objective but many of the fish in the population are still small (Table 4). The bluegills stocked in 2004 were from a stunted population and the reason growth appears slow. However, growth for age-1 and 2 bluegills equals or exceeds the statewide mean (Table 5).

Table 4. Bluegill trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE						0.0	7.9		28.8
PSD						--	18		80
RSD-18						--	3		10
RSD-P						--	1		0
Mean Wr						--	114		97

Table 5. Average back-calculated lengths (mm) for each age class of bluegills in Lake Henry, Bon Homme County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	6	66							
2005	2	41	55	102						
2004	3	37	45	90	142					
2003	4	53	41	93	134	156				
2002	5	78	50	92	126	153	168			
2001	6	73	49	84	122	145	159	168		
All Classes		**288**	**51**	**92**	**131**	**152**	**164**	**168**		
Statewide Mean			55	103	141	166				
Region III Mean			60	116	157	180				
SLI* Mean			53	101	138	163				

*Small Lakes and Impoundments (<150 acres)

Black Crappie

Management objective: Maintain a crappie fishery with a trap-net CPUE of at least 20 and PSD of at least 40.

The black crappie CPUE exceeded the management objective (Table 6) and the fish sampled ranged in length from 13 to 28 cm (5-11 in) with an average length of 177 mm (7 in). Recruitment is consistent and growth is faster than small lakes and impoundment means but below regional means (Table 7).

Table 6. Black Crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE						0.5	1.6		28.2
PSD						--	56		27
RSD-P						--	31		4
Mean Wr						--	103		100

Table 7. Average back-calculated lengths (mm) for each age class of black crappie in Lake Henry, Bon Homme County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	120	79							
2005	2	112	86	153						
2004	3	38	86	137	188					
2003	4	7	76	122	187	239				
2002	5	2	79	147	178	227	256	277		
All Classes		**279**	**81**	**140**	**184**	**233**	**256**	**277**		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Black Bullhead

Management objective: Maintain a bullhead fishery with a trap-net CPUE of no more than 100.

The high density largemouth bass population is apparently able to limit recruitment of small bullheads. Thus, Lake Henry contains a low density bullhead population comprised almost entirely of larger fish (Figure 1).

Table 8. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Henry, Bon Homme County, 1999-2007.

	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE						73.3	210.2		6.5
PSD						1	77		97
RSD-P						0	0		22
Mean Wr						85	90		90

All Species

Yellow perch numbers have steadily decreased since their introduction after the renovation (Table 9). Other rough fish or riverine species have also declined.

Table 9. Electrofishing (EF) and trap-net (TN) CPUE for all fish species sampled in Lake Henry, Bon Homme County, 1998-2007.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
COC (TN)							0.5	1.4		0.2
WHS (TN)							8.5	4.5		2.7
BLB (TN)							73.3	210.2		6.5
CCF (TN)							1.0	0.5		0.1
GSF (TN)							1.5	1.7		0.4
HYB (TN)							--	0.5		0.3
BLG (TN)							--	7.9		28.8
SMB (TN)							0.2	--		--
LMB (TN)							1.0	0.2		0.2
LMB (EF)							--	77.4		118.5
BLC (TN)							0.5	1.6		28.2
YEP (TN)							16.0	8.3		0.3

COC (Common Carp), WHS (White Sucker), BLB (Black Bullhead), CCF (Channel Catfish), GSF (Green Sunfish), HYB (Hybrid Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), LMB (Largemouth Bass), BLC (Black Crappie), YEP (Yellow Perch),

MANAGEMENT RECOMMENDATIONS

1. Conduct biennial netting and electrofishing surveys to monitor the fishery.

Table 10. Stocking record for Lake Henry, Bon Homme County, 2003-2007.

Year	Number	Species	Size
2003	12	Bluegill	Juvenile
	5	Bluegill	Adult
	204,460	Fathead Minnow	Adult
	18,510	Largemouth Bass	Juvenile
	105	Largemouth Bass	Adult
	39,262	Yellow Perch	Fingerling
	363	Yellow Perch	Adult
2004	1,829	Black Crappie	Adult
	1,510	Bluegill	Adult
	500	Channel Catfish	Adult
	1,029	Largemouth Bass	Adult
	400	Largemouth Bass	Juvenile
	1,016	Yellow Perch	Adult
	2,448	Yellow Perch	Fingerling

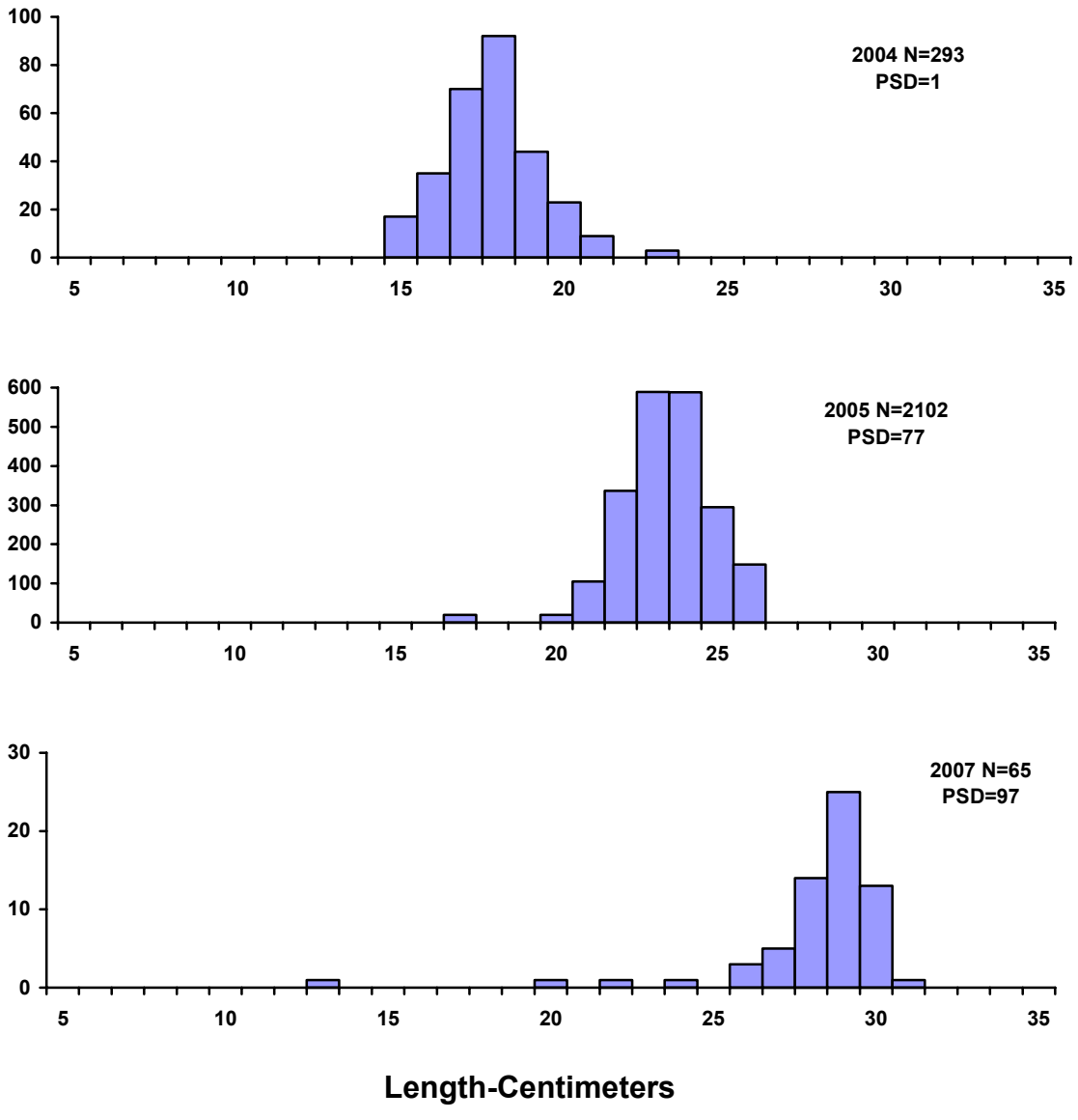

Figure 1. Length frequency histograms of black bullheads from Lake Henry, Bon Homme County, 2004, 2005, 2007.

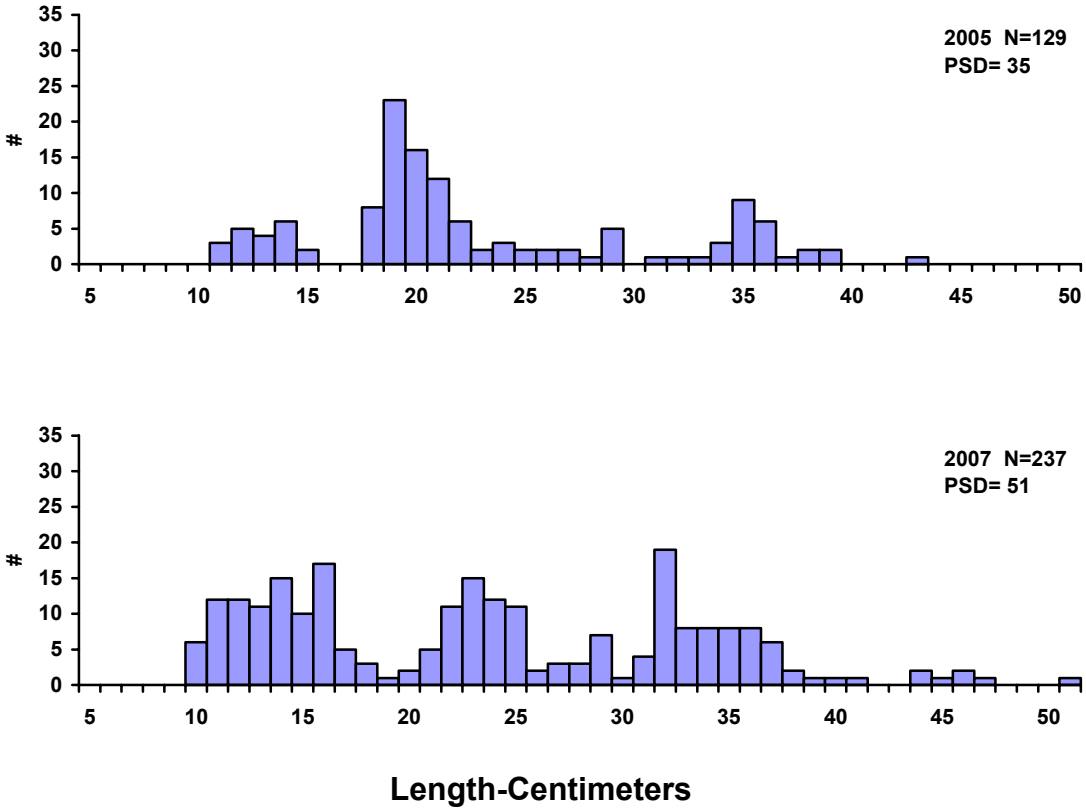

Figure 2. Length frequency histogram of largemouth bass from Lake Henry, Bon Homme County, 2005, 2007.

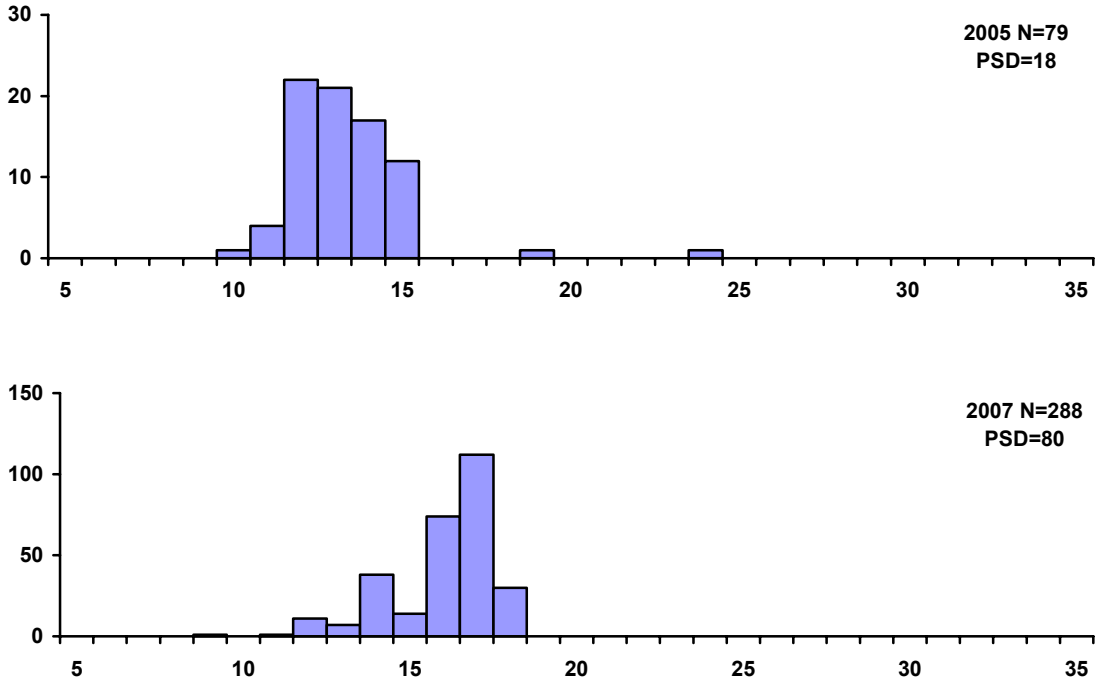

Figure 3. Length frequency histograms of bluegills from Lake Henry, Bon Homme County, 2005, 2007.

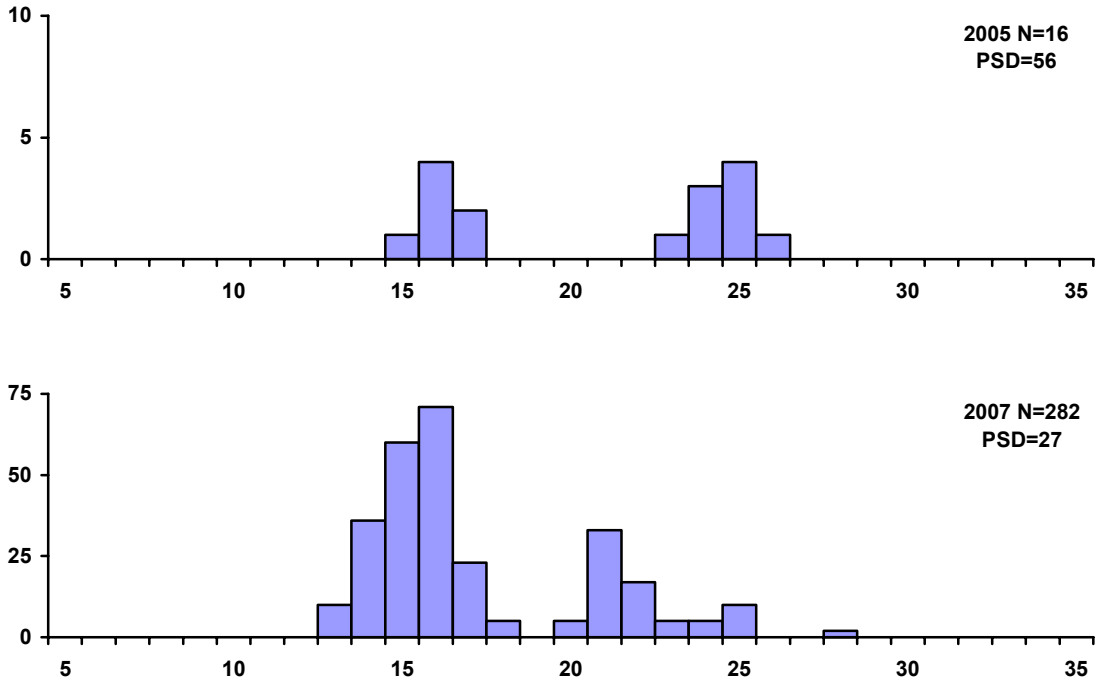

Figure 4. Length frequency histograms of black crappies from Lake Henry, Bon Homme County, 2005, 2007.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.